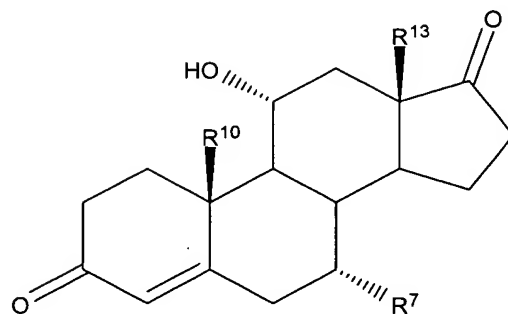


Claims:

1. Microbiological process for the production of 7α -substituted 11α -hydroxy steroids with general formula **4,B**:

**4,B**

in which

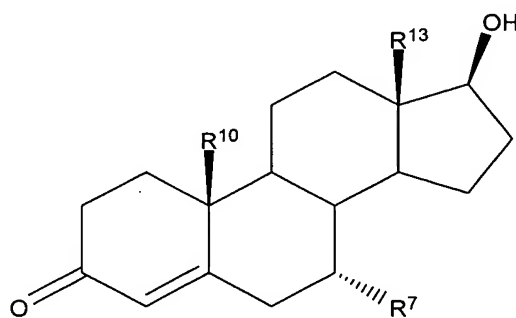
R⁷ is the grouping P-Q, whereby

P represents a C₁- to C₄-alkylene, and Q represents a C₁- to C₄-alkyl- or C₁- to C₄-fluoroalkyl, and the grouping P-Q is bonded via P to the steroid skeleton,

R¹⁰ can be in α - or β -position and stands for H, CH₃ or CF₃, and

R¹³ is methyl or ethyl,

in which a 7α -substituted steroid with general formula **3,A**:

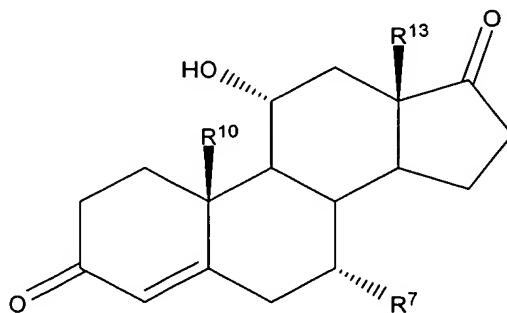
**3,A**

in which **R⁷**, **R¹⁰** and **R¹³** have the same meanings as indicated above,

is hydroxylated and oxidized with use of a microorganism that is selected from the group that comprises *Aspergillus sp.*, *Beauveria sp.*, *Glomerella sp.*, *Gnomonia sp.*, *Haplosporella sp.* and *Rhizopus sp.*

2. Process according to claim 1, characterized in that the microorganism is selected from the group that comprises *Aspergillus awamori*, *Aspergillus fischeri*, *Aspergillus malignus*, *Aspergillus niger*, *Beauveria bassiana*, *Glomerella cingulata*, *Gnomonia cingulata*, *Haplosporella hesperedica* and *Rhizopus stolonifer*.

3. Microbiological process for the production of 7 α -substituted 11 α -hydroxy steroids with general formula 4,B:



4,B

in which

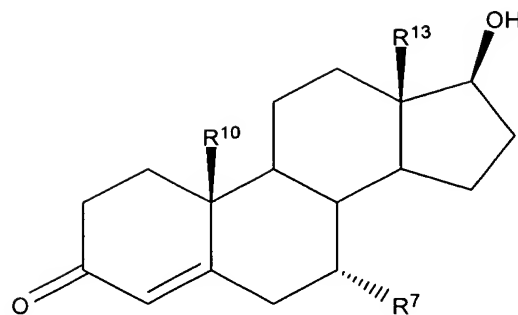
R⁷ is the grouping P-Q, whereby

P represents a C₁- to C₄-alkylene and Q represents a C₁- to C₄-alkyl- or C₁- to C₄-fluoroalkyl, and the grouping P-Q is bonded via P to the steroid skeleton,

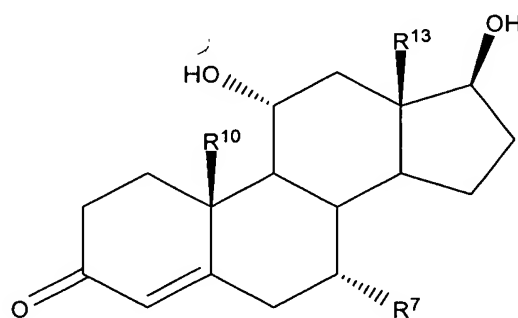
R¹⁰ can be in α - or β -position and stands for H, CH₃ or CF₃, and

R¹³ is methyl or ethyl,

in which a 7 α -substituted steroid with general formula 3,A:

**3,A**

in which R^7 , R^{10} and R^{13} have the same meanings as previously indicated, is hydroxylated in 11α -position in a first microbiological process step with use of a first microorganism that is selected from the group that comprises *Aspergillus sp.*, *Beauveria sp.*, *Gibberella sp.*, *Glomerella sp.*, *Gnomonia sp.*, *Metarrhizium sp.*, *Nigrospora sp.*, *Rhizopus sp.* and *Verticillium sp.*, with the formation of a 7α -substituted 11α -hydroxy steroid with general formula **C**:

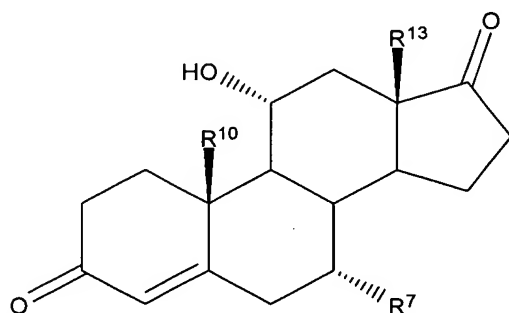
**C**

in which R^7 , R^{10} and R^{13} have the same meanings as indicated above, and the 7α -substituted 11α -hydroxy steroid with general formula **C** that is produced is then oxidized in a second microbiological process step with use of a second microorganism that is selected from the group that comprises *Bacillus sp.*, *Mycobacterium sp.*, *Nocardia sp.* and *Pseudomonas sp.*, with the formation of the 7α -substituted steroid with general formula **4,B**.

4. Process according to claim 3, wherein the first microorganism is selected from the group that comprises *Aspergillus malignus*, *Aspergillus melleus*, *Aspergillus niger*, *Aspergillus ochraceus*, *Beauveria bassiana*, *Gibberella fujikuroi*, *Gibberella zeae*, *Glomerella cingulata*, *Glomerella fusaroides*, *Gnomonia cingulata*, *Metarrhizium anisopliae*, *Nigrospora sphaerica*, *Rhizopus oryzae*, *Rhizopus stolonifer* and *Verticillium dahliae*.

5. Process according to one of claims 3 and 4, wherein the second microorganism is selected from the group that comprises *Bacillus lactimorbus*, *Bacillus sphaericus*, *Mycobacterium neoaurum*, *Mycobacterium smegmatis*, *Nocardia corallina*, *Nocardia globerula*, *Nocardia minima*, *Nocardia restrictus*, *Nocardia rubropertincta*, *Nocardia salmonicolor* and *Pseudomonas testosteroni*.

6. Microbiological process for the production of 7 α -substituted 11 α -hydroxy steroids with general formula **4,B**:

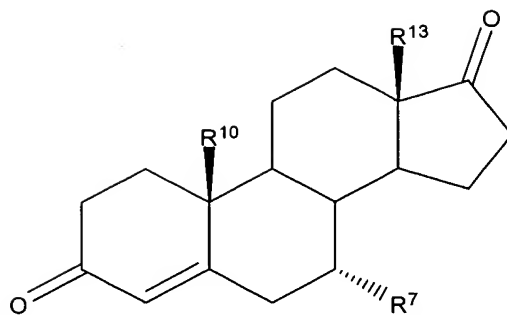


4,B

in which

- R⁷** is the grouping P-Q, whereby
P represents a C₁- to C₄-alkylene and Q represents a C₁- to C₄-alkyl- or C₁- to C₄-fluoroalkyl, and the grouping P-Q is bonded via P to the steroid skeleton,
R¹⁰ stands for H, CH₃ or CF₃, and
R¹³ is methyl or ethyl,

in which 7 α -substituted steroids with general formula **D**:



D

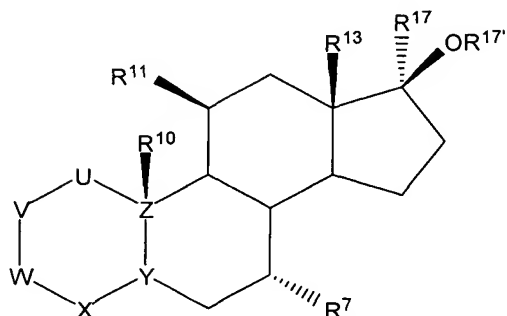
in which R^7 , R^{10} and R^{13} have the same meanings as indicated above, are hydroxylated with use of a microorganism that is selected from the group that comprises *Aspergillus sp.*, *Beauveria sp.*, *Curvularia sp.*, *Gibberella sp.*, *Glomerella sp.*, *Gnomonia sp.*, *Haplosporella sp.*, *Helicostylum sp.*, *Nigrospora sp.*, *Rhizopus sp.* and *Syncephalastrum sp.*

7. Process according to claim 6, wherein the microorganism is selected from the group that comprises *Aspergillus alliaceus*, *Aspergillus awamori*, *Aspergillus fischeri*, *Aspergillus malignus*, *Aspergillus melleus*, *Aspergillus nidulans*, *Aspergillus niger*, *Aspergillus ochraceus*, *Aspergillus variegatus*, *Beauveria bassiana*, *Curvularia lunata*, *Gibberella zeae*, *Glomerella cingulata*, *Glomerella fusaroides*, *Gnomonia cingulata*, *Haplosporella hesperedica*, *Helicostylum piriformae*, *Nigrospora sphaerica*, *Rhizopus oryzae* and *Syncephalastrum racemosum*.

8. Microbiological process according to one of claims 1 to 7, wherein R^7 stands for CH_3 .

9. Microbiological process according to one of claims 1 to 8, wherein R^{10} stands for H.

10. Microbiological process according to one of claims 1 to 9, wherein R^{13} stands for CH_3 .

11. 7 α ,17 α -Substituted 11 β -halogen steroids with general formulas 8, 10, and 12:**8,10,12**

in which

U-V-W-X-Y-Z stands for one of ring structures $C^1-C^2-C^3-C^4=C^5-C^{10}$, $C^1-C^2-C^3-C^4-C^5=C^{10}$ or $C^1-C^2-C^3-C^4-C^5-C^{10}$, whereby in this case, an oxo group ($=O$) is bonded to W ($=C^3$), or for ring structure $C^1=C^2-C^3=C^4-C^5=C^6$, whereby in this case radical OR^3 is bonded to W ($=C^3$),

R³ stands for H, C₁- to C₄-alkyl, C₁- to C₄-alkanoyl or a cyclic C₃- to C₇-ether with the O-atom of the OR^3 -radical,

R⁷ is the grouping P-Q, whereby P represents a C₁- to C₄-alkylene and Q represents a C₁- to C₄-alkyl- or C₁- to C₄-fluoroalkyl, and grouping P-Q is bonded via P to the steroid skeleton,

R¹⁰ can be in α - or β -position and stands for H, CH₃ or CF₃, and is present only if X-Y-Z is not $C^4-C^5=C^{10}$,

R¹¹ is a halogen,

R¹³ is methyl or ethyl,

R¹⁷ stands for H, C₁- to C₁₈-alkyl, alicyclic C₁- to C₁₈-alkyl, C₁- to C₁₈-alkenyl, alicyclic C₁- to C₁₈-alkenyl, C₁- to C₁₈-alkinyl, C₁- to C₁₈-alkylaryl, C₁- to C₈-alkylenenitrile or for the grouping P-Q, whereby the grouping P-Q has the above-mentioned meaning,

R^{17'} stands for H, C₁- to C₁₈-alkyl, alicyclic C₁- to C₁₈-alkyl, C₁- to C₁₈-alkenyl,

alicyclic C₁- to C₁₈-alkenyl, C₁- to C₁₈-alkinyl or C₁- to C₁₈-alkylaryl, whereby **R**^{17'} also can be bonded via a keto group to the 17β-oxy group, and whereby **R**^{17'} also in addition can be substituted with one or more groups NR¹⁸R¹⁹ or one or more groups SO_xR²⁰, whereby x = 0, 1 or 2 and **R**¹⁸, **R**¹⁹ and **R**²⁰ in each case independently of one another can have the same meaning as **R**¹⁷,

as well as their pharmaceutically compatible addition salts, esters and amides.

12. 7α,17α-Substituted 11β-halogen steroids according to claim 11, wherein U-V-W-X-Y-Z stands for ring structure C¹-C²-C³-C⁴=C⁵-C¹⁰ or C¹-C²-C³-C⁴-C⁵=C¹⁰ or C¹=C²-C³=C⁴-C⁵=C¹⁰.

13. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 and 12, wherein **R**¹ stands for H.

14. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 13, wherein **R**⁷ stands for CH₃.

15. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 14, wherein **R**¹¹ stands for fluorine.

16. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 15, wherein **R**¹³ stands for CH₃.

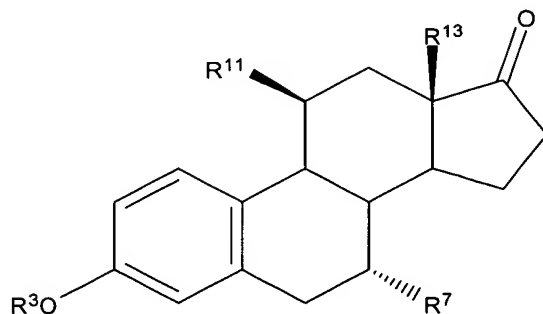
17. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 16, wherein **R**¹⁷ stands for H, CH₃, C₁- to C₁₈-alkinyl, CH₂CN or CF₃.

18. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 17, wherein **R**¹⁷ is ethinyl.

19. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 18, wherein **R**^{17'} stands for H.

20. 7α,17α-Substituted 11β-halogen steroids according to one of claims 11 to 19, namely
 17α-Ethinyl-11β-fluoro-17β-hydroxy-7α-methylestr-4-en-3-one
 17α-Ethinyl-11β-fluoro-17β-hydroxy-7α-methylestr-5(10)-en-3-one
 17α-Ethinyl-11β-fluoro-7α-methylestra-1,3,5(10)-triene-3,17β-diol.

21. 7α -Substituted 11β -haloestra-1,3,5(10)-trienes with general formula 6:



6

in which

- R^3 stands for H, C_1 - to C_4 -alkyl, C_1 - to C_4 -alkanoyl or a cyclic C_3 - to C_7 -ether with the O-atom of the OR^3 -radical,
- R^7 is the grouping P-Q, whereby
P represents a C_1 - to C_4 -alkylene and Q represents a C_1 - to C_4 -fluoroalkyl, and the grouping P-Q is bonded via P to the steroid skeleton,
- R^{11} is a halogen;
- R^{13} is methyl or ethyl,

as well as their pharmaceutically compatible addition salts, esters and amides.

22. 7α -Substituted 11β -haloestra-1,3,5(10)-trienes according to claim 21, namely

11 β -Fluoro-3-hydroxy-7 α -methylestra-1,3,5(10)-trien-17-one.

23. Process for the production of $7\alpha,17\alpha$ -substituted 11β -halogen steroids with general formula **10** according to one of claims 11 to 20, in which U-V-W-X-Y-Z stands for the ring structure $C^1-C^2-C^3-C^4=C^5-C^{10}$, with the following process steps:

- Nucleophilic substitution in a 7α -substituted 11α -hydroxy steroid with general formula **4,B** in 11-position with a halodehydroxylating reagent;

- Reaction of the 7α -substituted 11β -halogen steroid that is produced in this case with an alkylating agent in a selective manner on the C^{17} atom of the ring skeleton to form the $7\alpha,17\alpha$ -substituted 11β -halogen steroid with general formula **10**.

24. Process for the production of $7\alpha,17\alpha$ -substituted 11β -halogen steroids with general formula **12** according to one of claims 11 to 20, in which U-V-W-X-Y-Z stands for the ring structure $C^1-C^2-C^3-C^4-C^5=C^{10}$, with the following process steps:

- Nucleophilic substitution in a 7α -substituted 11α -hydroxy steroid with general formula **4,B** in 11-position with a halodehydroxylating reagent,
- Reaction of the 7α -substituted 11β -halogen steroid that is produced in this case with an alkylating agent in a selective manner on the C^{17} atom of the ring skeleton to form the $7\alpha,17\alpha$ -substituted 11β -halogen steroid with general formula **10**,
- Isomerization of the $7\alpha,17\alpha$ -substituted 11β -halogen steroid with general formula **10** to form the corresponding isomer with general formula **12**, in which U-V-W-X-Y-Z stands for the ring structure $C^1-C^2-C^3-C^4-C^5=C^{10}$.

25. Process for the production of $7\alpha,17\alpha$ -substituted 11β -halogen steroids with general formula **8** according to one of claims 11 to 20, in which U-V-W-X-Y-Z stands for the ring structure $C^1=C^2-C^3=C^4-C^5=C^6$ with the following process steps:

- Nucleophilic substitution in a 7α -substituted 11α -hydroxy steroid with general formula **4,B** in 11-position with a halodehydroxylating reagent,
- Oxidizing of the 7α -substituted 11β -halogen steroid that is produced in this case to form 7α -substituted estra-1,3,5(10)-triene with general formula **6** according to one of claims 17 and 18;
- Reaction of the 7α -substituted estra-1,3,5(10)-triene with general formula **6** with an alkylating agent in a selective manner on the C^{17} atom of the ring skeleton to form the $7\alpha,17\alpha$ -substituted 11β -halogen steroid with general formula **8**.

26. Use of the $7\alpha,17\alpha$ -substituted 11β -halogen steroids with general formulas **8**, **10**, and **12** according to one of claims 11 to 20 for the production of pharmaceutical agents.

27. Pharmaceutical preparations that contain at least one $7\alpha,17\alpha$ -substituted 11β -halogen steroid with general formulas **8**, **10**, and **12** according to one of claims 11 to 20 as well as at least one pharmaceutically compatible vehicle.